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It's Morse to the Rescue

By RALPH VARTABEDIAN,
Times Staff Writer

In orbit high above Earth, a multibillion-dollar formation of communications satellites stands ready to instantly connect military leaders in Washington with every American warship and military base in the world. But what if this technological masterpiece should go haywire or be knocked out by an enemy attack? The Pentagon's sophisticated communications net could go silent and leave troops groping for leadership.

Not to worry. The Pentagon has a backup plan, in part using technology that was invented in 1835, the year Mark Twain was born. It's the Morse code, the language of dots and dashes that has survived the assault of higher technology for a century and a half. Even in an age when the human voice can be synthesized by a machine and lasers can transmit data over glass-fiber cables, Morse telegraphy has held firmly to the place it has staked out. It is used not only by the military but routinely by civilians and commercial enterprise.

Dots and Dashes

Named after its inventor, Samuel F.B. Morse, the code is a series of combinations of short and long tones (dots and dashes) representing letters of the alphabet that can be transmitted manually by a key operator. A telegrapher combines the dots and dashes to form letters and words. It is a seemingly tedious procedure but skilled operators can transmit and receive faster than most secretaries can type. The fastest Morse transmission ever recorded was 84 words per minute, sent by an operator named T.L. McElroy.

Morse telegraphy may seem like a quaint anachronism--with its brass sounder and key operated by the world's most basic tool, the human finger. In fact, however, it is sometimes vital to worldwide communications. "When the Mexico City earthquake occurred [in 1985] and all the power went out, guess who was transmitting calls for international help? It was amateur radio operators using Morse telegraphy," said Marcus Stevens, an official at the Federal Communications Commission.

Reliable Standby

Advanced communications satellites can transmit 100 volumes of an encyclopedia in a second, whereas a journeyman Morse operator can send about 50 words per minute. But if sophisticated space systems fail, a portable, battery-powered Morse transmitter would be invaluable. "We see the Morse code as a dying art, but we refuse to let it die completely," said Maj. Gen. Leo M. Childs,

the Army's chief signal officer. "Newer isn't always better. Even though it is old and slow, Morse is still the most reliable in difficult conditions." Of course, the most difficult condition imaginable would be a nuclear war, in which any survivors could have only Morse telegraphy for long-distance communications. In the event of widespread devastation, the Pentagon has organized 4,500 civilian amateur radio operators across the country who would attempt to operate a national communications system by broadcasting in Morse code.

But Morse code is not just for use in time of war. Every merchant vessel bearing the U.S. flag must carry a radio officer who can both transmit and receive Morse code. Under U.S. law, the officer must spend eight hours every day at sea monitoring the radio for Morse distress calls.

Should you ever find yourself adrift at sea in a lifeboat launched from a sinking passenger cruise ship, it will be equipped with a single communications device: a Morse transmitter that automatically signals a distress call and a key in case you happen to know the Morse code. Perhaps the best-known bit of Morse code is the call for help--SOS which stands for "Save Our Ship" or "Save Our Souls." In the code, it is ... - - - ... (dot dot dot, dash dash dash, dot dot dot). Taxi passengers in major cities hear radio dispatchers send a stream of Morse code. Under FCC rules, such private broadcasting operations must periodically identify their station and typically use Morse code to send their call letters.

Industrial Burst

The enduring use of Morse telegraphy is the legacy of a burst of industrialization in 19th-Century America, when railroads and telegraph developed side-by-side. "The telegraph revolutionized the way people lived," said W.K. Dunbar, president of the Morse Telegraph Club in Normal, Ill. "It created for the first time the ability to transmit news across the country almost instantaneously." Most of those railroad telegraph lines were used well into the mid-20th century, well after radio, television and computers became commonplace. "Until 1985, the Milwaukee Road had a Morse telegraph line between Milwaukee and La Crosse, Wis., that was used routinely to relay train orders to train crews. The telegrapher in La Crosse would write down on paper an order from Milwaukee and would pass it to a moving train by holding up a loop of string with the message attached. The engineer would lean out of the locomotive and catch the loop in his arm-"on the fly;" as railroaders say. This Milwaukee Road operation was shut down quietly three years ago, when Howard Hargas sent telegraph operator Fred Becker in La Crosse what may have been the last telegraph in American railroading. "I sent the last message to Fred," recalled Hargas, a dispatcher on the Milwaukee Road, in a recent interview. "It said that after this message, Morse code wouldn't be used any more. At that point, we pulled the power on the Morse lines."

Of course, it was not the end of Morse code, even in railroading.

It is still used by railroads in developing nations, including Mexico. "About one month ago, I was on an excursion down in Sonora, and a couple of stations were still using telegraph land lines," said Chard walker, a retired railroader who is now with the Orange Empire Railway Museum in Ferris, Calif. Some old-timers claim that a few branch rail lines in the United States still use the manual telegraph, but that could not be confirmed. "Are you talking about the dots and the dashes?" asked a dispatcher at the Elgin, Joliet & Eastern Railroad in Illinois. "We are behind the times, but we aren't that bad."

Serious Users

But the military services do not consider themselves behind the times, and they continue to be the most serious users of Morse telegraphy. While billion-dollar satellites and sophisticated ground networks are good in theory, such communications systems can break down on the battlefield. In the U.S. invasion of the Caribbean island nation of Grenada in 1983, for example, communications became so tangled that one soldier was forced to make a credit card call to a U.S. military base from a telephone booth on the island. "As a matter of prudence," Gen. Childs said, the Army keeps a basic Morse capability. "Suppose our satellites were being jammed? The morse code is the last-ditch method." Morse code signals can get through because they require much less broadcasting power to transmit than voice messages. In addition, even a distorted Morse signal can be interpreted, whereas a distorted voice transmission is virtually useless. The Army annually trains about 2,800 men and women in Morse code for a variety of signal jobs in infantry, artillery, intelligence and even Special Forces. For example, Army commandos who are sent behind enemy lines to organize dissident civilians must be able to communicate clandestinely. They do it with Morse telegraphy that is transmitted in bursts too short to be located by enemy listening posts, Childs said. The Navy considers Morse code capability of critical importance, owing to atmospheric disturbances that sometimes block radio voice transmissions.

Sunspot Cycle

"During the 11-year cycle of sunspots, you can run into times in certain areas of the globe where you cannot communicate with any of your equipment except with a Morse signal," said Senior Chief Petty Officer Alexander Constantopoulos, a Navy radio operator. "A machine can do only so much. If it doesn't get a quality transmission, you are going to get garbage. But with Morse, no matter how much distortion there is, you can copy that signal. Only human hearing can do that." In addition to ships some of the Navy's older airplanes, such as the early P-3 Orions and A-6 attack jets, also carry Morse telegraphy keys in their cockpits. The Air Force trains hundreds of enlistees each year in Morse code, principally to monitor communications by foreign armed services. The Red Army continues to use the code for its communications, according to a former Soviet radioman.

Although nobody can forecast what a nuclear war would be like,

virtually all worldwide communications would be shut down by two different nuclear effects. An electro-magnetic pulse would create powerful shocks over a wide area to electrical devices and wires, probably destroying most radios, computers and communications gear, according to Kota Tsipis, a physicist at the Massachusetts Institute of Technology. The second effect in the aftermath of a detonation would obstruct radio transmissions. "The atmosphere would be saturated with ionized particles such that you will not be able to communicate with voice or data," explained Constantopoulos, the Navy radio operator. "But a Morse transmission will get through. It is very slow, but it is the most reliable."

He added: "He who communicates first, no matter how primitive, will come out on top." In that case, retired railroad telegraph operators would probably take over the world. Each evening, the amateur radio waves come alive with the Morse transmissions of the retired railroaders known among themselves as "old heads." "I get on the air and use the code every night to talk to old railroad men," said Becker, the retired Milwaukee Road telegraph operator who received the railroads final telegraph message in 1985. "There are lot of telegraphers around. Every night you hear them pecking." Experienced Morse operators say the code is not so much a clatter of sounds as a language, because operators don't hear dots and dashes. "You can sit back and hear a conversation," said Dunbar, the president of the Morse Telegraph Club. "You aren't an operator until you hear the words."

There are two Morse codes--the international code and the American railroad code--with some differences in the dot-dash combinations. The American code primarily uses sounders that produce clicks; the dots and dashes are distinguished by the time intervals between clicks. The international code normally uses an audio tone for the dots and dashes, making it easier to distinguish between them.

Far More Weight

When Morse inaugurated telegraph service in 1844, he wired from Baltimore to Washington the now-famed message: "What hath God wrought!" Ever since then, the demise of Morse code has been predicted regularly. But for more than five decades after the invention of the telephone in 1864, Morse telegrams were the world's dominant form of telecommunications.

"Telegraph was there before the telephone and carried on for years after," said Burke Stinson, a public relations man for American Telephone & Telegraph Co. "You have to appreciate that the written word carried--and still does carry--far more weight than the spoken word." Only a third of American homes had a telephone by 1936, and during World War II the Western Union Telegraph Co. had 15,000 messengers to deliver telegrams across the country.

Western Union continued to use the telegraph until the mid-1960s. And it was not until just this year that it quietly dropped the word telegraph from its name and officially became the Western Union Corp.

Although the telegraph has receded from public view, experts say that they cannot envision an end to its use any time soon. "I can carry a very small Morse key in my pocket and transmit around the world," said Stevens, the FCC official. "I don't think you will ever see the Morse code die. It is going to be difficult to find another method that is just as good."